

Technical Specification

No. TRA2000.doc
Revised 04.January 2007

1 Tester Type TRA2000-System with S/N > 800

The TRA2000 includes all circuits and CDN to carry out immunity tests on power supply in accordance with IEC 61000-4-4 Ed.2, -5 Ed.2, -11 Ed.2. When accessories are added the TRA2000 can be expanded to comply with IEC 61000-4-2, -8, -9, -12 Ed.2 (ring wave), -16, -29. The Genes software to the TRA2000 is the most sophisticated software for Transient Immunity tests.

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1.1 Introduction

The one box solution for full compliance transient immunity testing. The TRANSIENT2000 is a flexible one box test and measurement equipment for immunity transient tests on power supply 110V or 230V. The TRA2000 generators are compact and have an excellent value for money.

- All relevant parameters in one display
- Easy parameter changes during operation
- Magnetic field up to full levels
- Protocol when needed
- The GENECS Software is the most sophisticated Software for transient immunity tests
- Dialogue line language can be chosen

2 General

2.1 Brief description of the generator

The TRA2000 includes all necessary circuit ESD, EFT, SURGE, Dips, Variation -immunity tests. In addition outstanding feature are:

- Easy protocol of all test results
- Automatic summarisation of the test results in the log file
- Measurements of i and v peak for SURGE.
- Variac in the standard unit for voltage variation, magnetic field tests and d.c. and a.c. test in accordance with IEC 61000-4-16

2.2 EUT connection (equipment under test)

The EUT is connected on the front panel of the TRA2000 tester.

2.3 Standards, applications

Basic Standard IEC/EN	EMC PARTNER Generators	Remarks	Generic Standards application IEC/EN
61000-4-2	TRANSIENT2000 (ESD) plus ESD-Mouse	Full compliant	61000-6-1
61000-4-4 Ed.2	TRANSIENT2000 (EFT)	Full compliant	61000-6-1
61000-4-5 Ed.2	TRANSIENT2000 (SURGE) CWG	Full compliant	61000-6-1
61000-4-11 Ed.2	TRANSIENT2000 (DIPS)	Full compliant	61000-6-1
61000-4-29	TRANSIENT-1000 (DIPS on dc)	DIPS Full compliant no variation	

On request:

TRA2000 can carry out following tests in accordance with listed standards, with relevant TRA2000Inx model

61000-4-5 10/700	TRANSIENT2000INx	Full compliant	61000-6-1
61000-4-8	TRANSIENT2000 (Variation) plus MF1000-1; -2;-3, MF1STAND	Full compliant	61000-6-1
61000-4-9	TRANSIENT2000 (SURGE) & MF1000-1	Full compliant	61000-6-1
61000-4-12 Ed.2 "Ring wave"	TRANSIENT2000INx	Full compliant	61000-6-1
61000-4-16	TRANSIENT2000 part DC and 50/60Hz	No CW signal generator included up to 150 kHz	

3 Generator circuit, Technical Data

3.1 Mechanical dimensions, climatic conditions

The Tester TRA2000 is a 19" plug-in system for a 19" rack.

Type	Dimension [mm]	Weight	Version
	width x depth x height [mm]	[kg]	
TRA2000	520 x 433 x 180 mm	32	19" 4UH

The power line input is located at the rear side of the TRA2000.

Voltage between phase and neutral	230 V (50 Hz) 115 V (60 Hz)	± 10 % ± 10 %
Power consumption	operation mode < 800 VA Standby < 100 VA Power OFF < 10 VA	(230 V, 50 Hz) (115 V, 60 Hz)

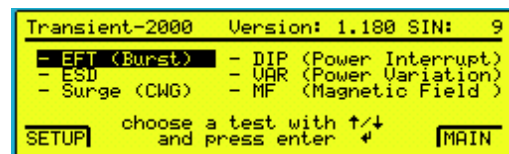
Following power cords can be ordered:

Europe (CEE-7/VII) England (BS-1363) Switzerland (SEV Type 12) USA (NEMA5-15P)

Environment conditions		
Temperature range	°C	0 to 35 °C
Humidity	rh %	25 to 80%
Pressure	kPa	86 to 106



TRA2000"



Display

Accessories included:

- Power cord (1 x 2m): D Schuko (16A), CH (10A), USA (16A), UK (13A)
- MC cables with protected banana plugs; black, blue and green/yellow (3 x 2m)
- Remote control cable 25/9 pole (1 x 3m)
- CENTRONICS adapter (1 pce)
- User manual (1 pce) including:
 - Declarations of conformity: EMC, LVD, BASIC
 - Verification protocol EMC PARTNER
 - EMCP Software Package (1CD)

3.2 Technical data

3.2.1 EFT circuit

Voltage waveform into 50 Ω :	Impulse Outpur		Chap 14.1.1 IEC 61000-4-4
Risetime	5 ns	$\pm 30\%$	
Half time value	50 ns	$\pm 30\%$	
Voltage waveform into 1000 Ω :			
Risetime	5 ns	$\pm 30\%$	
Half time value	100 ns	- 50 ns	+ 100 ns
Adjustable voltage range	250 V to 4400 V		
Voltage amplitude into 50 Ω	125 V to 2000 V	$\pm 10\%$	
Voltage amplitude into 1000 Ω	250 V to 4000 V	$\pm 20\%$	
Source impedance	50 Ω	$\pm 10\%$	
Spike frequency	1 kHz up to 1 MHz		
Maximum Spikes per seconds	8'000 at 1000 V		1000 at 4000 V
Burst duration	0,001 ms up to 20 ms		
Burst repetition	1 ms up to 1000 ms		
Polarity	positive / negative		
Ramps	-Voltage -Spike frequency -Synchronisation -Burst duration		
High voltage output	10 nF decoupled	max. 450 V ac	

3.2.2 Coupling / De-coupling Network EFT

Maximum EUT power supply voltage	260 V ac 50/60 Hz		
Maximum allowed continuous current	16 A		
Spike waveform superimposed onto the lines of the EUT power supply	within the tolerances as above		Chap 14.1.1 IEC 61000-4-4
damping between output and input of the CDN	better 30 dB		
Coupling paths:	L-GND; N-GND, PE-GND, L+N+PE - GND L+N - GND; L+PE - GND; N+PE - GND		

3.2.3 ESD circuit, accessories ESD Mouse

Energy storage capacitance	150 pF	± 10%	
Discharge resistance	330 Ω	± 10%	
Charging resistance	54 MΩ		
holding time (drop to 95%)	better than 5 s		
Current rise time, 2 Ω load	0,7 to 1 ns		See 14.1.2 IEC 61000-4-2
Definition of current waveform:			
Current amplitude at 30 ns	4 to 16 A	± 30%	
Current amplitude at 60 ns	2 to 8 A	± 30%	
Voltage range „air discharge“	2 to 15 kV	± 10%	
Voltage range „contact discharge“	2 to 8 kV	± 10%	
First current amplitude into 2 Ω „contact discharge“	7,5 to 30 A	± 10%	
Polarity	positive / negative; automatic switchover		
Number of discharges Detection of the number of discharges	-preselectable -count every pulse -count discharge only. Only the impulses whereas the voltage of the discharge capacitor tropes lower then 10% of the charging voltage are counted.		
Ramps	voltage amplitude changes from shot to shot, alternate polarity		
Reporting	test sequence with the number of discharges -Voltage amplitude -Polarity		
Discharge modes:	-Air discharge -Contact discharge		
Repetition of the discharges	1 to 20 Hz Single discharge		

3.2.4 SURGE circuit

Waveform at no load :	Impulse output		See 14.1.3
Front time	1.2 μ s	$\pm 30\%$	
Time to half value	50 μ s	$\pm 20\%$	
Waveform at short circuit:			
Front time	8 μ s	$\pm 20\%$	
Time to half value	20 μ s	$\pm 20\%$	
Preselectable voltage range	220V to 4100 V		
Open circuit output range	250 V to 4000 V	- 0%; +10%	-
Short circuit output current	125 A to 2000 A	- 0% + 10%	
Output impedance Umax / Imax	2 Ω	$\pm 0.25 \Omega$	
Polarity	positive / negative / altn		
Ramps	-Voltage -Polarity -Synchronisation		
High voltage output "low"	maximum voltage between „low“ and earth 260 V ac		
Time between successive shots	3 s		5s at 4000 V

3.2.5 Coupling / De-coupling Network „CDN-SURGE“

Maximum allowed voltage phase neutral	260 V ac 50/60 Hz	16A	
Coupling path phase- earth	9 μ F + 10 Ω	(L-PE)	
Coupling path neutral - earth	9 μ F + 10 Ω	(N-PE)	
Coupling path phase - neutral	18 μ F	(L-N)	
Coupling modes:	L-N; L-PE; N-PE, automatic coupling path switching		

3.2.6 DIPS circuit complies with IEC 61000-4-11 for a.c. power ports.

Voltage range a.c.	0 to 260 V	EUT Power	See 4.2
Frequency range without variac	DC up to 400 Hz		external Source
Frequency range with variac involved	48 Hz to 400 Hz		external Source
Nominal current	16A		
Interruption with internal variac and linear load	maximum 12 A maximum 16 A		< 5s < 300 ms
Inrush current	500 A Peak	- 0%, +30%	See 14.1.4
Interruption time	50 µs to 30 s		phase angle selectable
Amplitude interruptions with the internal variac	continuously selectable 0 to 100 %	Max. 5A	IEC: 0 %, 40 %, 70 %, 80%
Phase angle for turn ON and OFF of the EUT selectable	0 to 360°	± 5°	
Voltage variation with the internal variac	0 to 110 %	Max. 5A	2 s to 30000 s
Voltage variation with external variac	0 to 110 %	Max 16A	2 s to 30000 s
Less than 1 period More than one period d.c. interruption	Interruption within one period. Input as angle Interruption longer then one period. Input in ms Input in ms		
Ramps	-Voltage -Synchronisation angle -Interruption time		
Interruption for all kind of loads UT= voltage at EUT Power 1	DIP 100 %	% UT 0 %	0 to 16 A



For 0 to 100% interruptions the internal Variac is not used, the test can be carried out up to 16 A.

Interruption with UT =EUT Power 1 voltage not zero, using the internal variac limits the EUT power current.

The maximum current values are listed in the table on the next page.

Different load types influence the maximum current capability.

With internal Variac:

Types of loads: switching from to		Variable power consumption maximum 2.6 kW at UT 230 V . With reduction of the voltage the current is also reduced. Examples: Ohmic -, inductive -, capacitive -, mixed loads	Constant power consumption maximum 1,2 kW at UT = 220V . With reduction of the voltage the current is increased. Example: switched power supply	voltage change in % of UT at current change 0 to 100 % UT= voltage at EUT Power 1
UT	% UT	current range r.m.s	current range r.m.s	% of UT
100 %	0 %	0 to 16A	0 to 16A	0.7 %
100%	80%	0 to 10 A	0 to 5A	4%
100%	70%	0 to 9 A	0 to 6 A	4%
100%	40%	0 to 5 A	0 to 10 A	5%

Note: all values apply for switching time at %UT< 5 s

3.2.7 Interruption and Voltage Variation IEC 61000-4-11 with external Variac

Types of loads: switching from to		Variable power consumption maximum 3.7 kW at UT 230 V . With reduction of the voltage the current is also reduced. Examples: Ohmic -, inductive -, capacitive -, mixed loads	Constant power consumption maximum 3,7 kW at UT = 220V . With reduction of the voltage the current is increased. Example: switched power supply	voltage change in % of UT at current change 0 to 100 % UT= voltage at EUT Power 1
UT	% UT	current range r.m.s	current range r.m.s	% of UT
100 %	0 %	0 to 16A	0 to 16A	0.7 %
100%	80%	0 to 12.8 A	0 to 20A	4%
100%	70%	0 to 11.2 A	0 to 23 A	4%
100%	40%	0 to 6.5 A	0 to 40 A	5%

Note: all values apply for switching time at %UT< 5 s


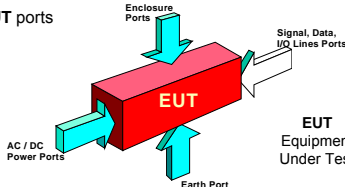

3.2.8 DIPS circuit in accordance with IEC 61000-4-29 for d.c. power ports.

Voltage range d.c.	20 to 110 V	EUT Power	
Current range	0 up to 16A		
Inrush current capability at 110 V	220A Peak	- 0%, +30%	See 6.1.1
Interruption time	1ms up to 29999 ms		
Rise and fall time at 100 Ohm load	between 1 µs and 50 µs		See 6.1

IEC 61000-4-29 page 19:

The use of a generator with higher or lower voltage/current capability is allowed provided that the other specifications are preserved. The test generator steady state power/current capability shall be at least 20% greater than the EUT power/current ratings.

3.2.9 Overview accessories

Test System And Standards			EUT ports					Verification, PC-Control- Accessories		
										
			EUT Equipment Under Test					In addition we offer for carrying out EMC test and measurements in your company:		
IEC Standards	Max. Values of EMC-PARTNER Testers	Tester type	AC/DC	Signal Telecom	Signal	Earth	Enclosure	Calibration Verification	Test set-up	Control via PC
1000-4-2 ESD	CD* 8kV; AD* 15kV	TRA-2000	-	-	-	-	1+2 (13)	9,19	20 (21)	14 (16, 23)
1000-4-4 EFT	4,4 kV; 1MHz	TRA-2000	1 (12)	1+3	1+3	1+3	-	10,19	20 (21)	14 (16, 23)
1000-4-5 SURGE	CWG 4,1 kV 2 kA	TRA-2000	1 (12)	1+18	1+4	1+5	1+5	19	-	14 (16, 23)
1000-4-8 a.c. MF	160A/m, 1050A/m	TRA-2000	-	-	-	-	1+7+8+15 (22)	-	22	14 (16, 23)
1000-4-9 Surge MF	1600 A/m	TRA-2000	-	-	-	-	1+7+8 (22)	-	22	14 (16, 23)
1000-4-10 Oscil. MF	120 A/m	MIGOS-OM	-	-	-	-	1+7+8 (22)	-	22	-
1000-4-11 DIPS	16 A different levels	TRA-2000	1 (6, 12)	-	-	-	-	11,19	-	14 (16, 23)
1000-4-11 Variation	5 A different levels	TRA-2000	-	-	-	-	-	-	-	-
1000-4-12 Ring	6 kV	MIG0603IN4	1 (12, 24)	-	-	-	-	19	-	14 (16, 23)
1000-4-12 Oscillation	3 kV, 1MHz, 100kHz	MIGOS-OSI	1 (24)	-	-	-	-	-	-	-
1000-4-13 Harmonics	16 A, 230 V	HAR-1000	1	-	-	-	-	19	-	14 (16)
1000-4-14 V-variation	16 A, 230 V	HAR-1000	1 (6, 12)	-	-	-	-	19	-	14 (16)
1000-4-16 Common Mode	300 V a.c., 300 V d.c.	TRA-2000	-	1+17	1+17	-	-	19	-	14 (16, 23)
1000-4-17 Ripple on d.c.	16 A, 200V d.c.	HAR-1000	1 (6, 12)	-	-	-	-	19	-	14 (16)
1000-4-29 DIP on d.c.	16 A, 110V	TRA-2000	1	-	-	-	-	19	-	14 (16, 23)

N°	Description / Accessories	N°	Description / Accessories	N°	Description / Accessories
1	See colon "Tester type"	9	Measuring Target ESD 2 Ω	17	NW16S, CN16, CN16T
2	ESD discharge circuit, Relay, Finger	10	Measuring set EFT 50 Ω / 1 kΩ	18	Coupling Kit Telecom CDNKIT1000T
3	Coupling clamp CNEFT1000	11	Measuring-set DIPS (inrush current)	19	Certificate and Protocol
4	SURGE coupling kit CDNKIT1000	12	Three phase coupling CDN2000-06-32	20	Connection set
5	Test tip CN-TRA	13	ESD stand	21	Test set-up accessories
6	External Variac VAREXT-1000 (16/32A)	14	GENECS to TRA, HARCS-Immunity to HAR	22	Stand to MF1000-1 or MF1000-2
7	Antenna for magnetic field MF1000-1 1x1m	15	Antenna for magnetic field MF1000-1 1x1m, 3s	23	Fibre Optic link
8	Antenna for magnetic field MF1000-2 1x2.6m	16	EUT Monitor for EUT failed control	24	Three phase coupling CDN2000-06-25

*CD = Contact Discharge *AD = Air Discharge

3.2.10 Overview versions

The TRA2000 can be ordered in different versions as:

TRA2000 Version EFT-ESD
 TRA2000 Version SURGE
 TRA2000 Version DIPS
 TRA2000 Version DIPS-SURGE
 TRA2000 Version EFT-ESD-DIPS
 TRA2000 Version EFT-ESD-SURGE



Transient Test System

Brief Overview of Phenomena.	.2
Applicable Standards	.3
Test System Overview.	.4
Generator Specifications.	.9
Accessories and Options.	10
Software	14
EMC PARTNER's Product Range	15

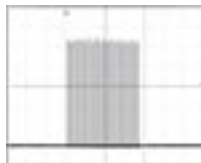
Brief Overview of Phenomena

Transient Test System generates EMC events that can be observed in the low power distribution system, telecommunication or data lines.

Transient Test System replicates the following phenomena:

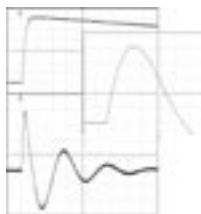
- **Electrostatic Discharges (ESD)**

A person becomes electrostatically charged by walking over an insulating floor surface. The capacity of the body can be charged to several kilovolts and is discharged when contact is made with an electronic unit or system. The discharge is visible as a spark in many cases and can be felt by the person concerned, who receives a „shock“. The discharges are harmless to humans, but not to sensitive, electronic equipment. The resulting currents cause interference or make entire systems „crash“.



- **Electric Fast Transients (EFT) / Burst**

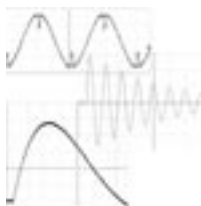
Industrial measurement and control equipment nearly always use conventional control units containing relays or other electro-mechanical switching devices. Fluorescent lamp ballast units, insufficiently suppressed motors (hair dryers, vacuum cleaners, drills, etc.) are found everywhere in the public power supply. All of these are primarily inductive loads which generate interference when switched on or off. EFT events, can cause microprocessor units to malfunction or reset, with corresponding disruption to normal operation.



- **Combination Wave Generator (CWG), Ring Wave and 10/700µs**

Surge events can be generated by lightning phenomena, switching transients or the activation of protection devices in the power distribution system. A surge itself is influenced by the propagation path taken so that impulses from the same event may have different forms depending upon where a measurement is taken. Combination Wave Generators (CWG) simulate a surge event in power lines close to or within buildings. Ring waves are bipolar oscillatory events, only measured on power lines within a well protected environment. Because of the special impedance characteristics within telephone systems, surges tend to be longer and are represented by the 10/700µs waveform.

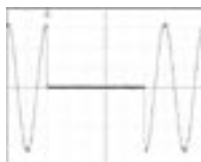
Mostly the disturbances are tolerable because they are single events.



- **Power Frequency and Pulse Magnetic Fields**

Under normal operating conditions, an AC current generates a steady magnetic field so that equipment, such as monitors, close to AC power lines could suffer interference. Under fault conditions, a sudden high current level can result in a short duration magnetic field.

Lightning strokes or short circuit fault currents in the power network can generate high level short duration magnetic fields.



- **AC & DC Dips/Interrupts**

Voltage failures occur following switching operations, short-circuits, response of fuses and when running up heavy loads.

The quality of the electrical power supply is increasingly becoming a central topic of discussion. The interference sources in the mains, caused by electronic power control with non-linear components e.g. thyristors are used more frequently in domestic appliances such as hotplates, heating units, washing machines, television sets, economy lamps, PCs and industrial systems with speed-controlled drives.

Accessories are available to extend applications to include:

- Common mode tests (DC to 150kHz)
- Telecommunication tests (10/700µs balanced & un-balanced)
- Three phase testing to 32A (EFT, surge, ring wave)
- Three phase testing to 32A (dips & interrupts)

Applicable Standards

International Electrotechnical Committee (IEC)

IEC 61000-4-2 (Ed1.2:2001): Testing and measurement techniques - Electrostatic discharge immunity test.

IEC 61000-4-4 (Ed2:2004): Testing and measurement techniques - Electrical fast transient / burst immunity test.

IEC 61000-4-5 (Ed2:2005): Testing and measurement techniques - Surge immunity test.

IEC 61000-4-8 (Ed1.1:2001): Testing and measurement techniques - Power frequency magnetic field immunity test.

IEC 61000-4-9 (Ed1.1:2001): Testing and measurement techniques - Pulse magnetic field immunity test.

IEC 61000-4-11 (Ed2:2004): Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests.

IEC 61000-4-12 (Ed2:2006): Testing and measurement techniques - Oscillatory waves immunity test (Ring wave).

IEC 61000-4-16p (Ed1.1:2002): Testing and measurement techniques - Test for immunity to conducted, common mode disturbances in the frequency range 0Hz to 150kHz.

IEC 61000-4-29 (Ed1:2000): Testing and measurement techniques - Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests.



European Standard (EN)

The same standards are applicable as for IEC (see above).



International Telecommunications Union (ITU)

K.20 (February 2000): Resistibility of Telecommunications Equipment installed in a telecommunications centre to overvoltages and overcurrents



American National Standards Institute (ANSI)

C62.41 (Date): American National Standard for Electrostatic Discharge Test Methodologies and Criteria for Electronic Equipment.



Test System Overview

Test System Feature

Transient Test System has many unique and outstanding features:

- Up to 6kV surge levels
- CWG, 10/700µs **and** ring wave together in one instrument
- Internal motor variac
- All parameters on one screen
- Parameter change during operation (+/-)
- Internal program memory
- Backlit LCD display
- Electronic polarity change
- Semiconductor switches
- Compact design
- Fulfills ALL standard requirements
- Magnetic field test menu
- Expansion to 3-phase capability
- Remote control and software upgrade through standard interface
- Wide range of accessories
- 2 year warranty

User Benefits

The technical excellence and many unique features translate directly into benefits for the user:

- Cost effective solution to meet many test requirements
- Increase quality of test object
- Real time parameter change, ideal development tool
- Save operator time with the automated test routines and test report facility
- Easy integration into a full test suite
- Unparalleled reliability and system up-time

Generators

Transient Test System comprises three generator models (TRA2000, TRA2000IN4 and TRA2000IN6).

Available with single or multiple events (ESD, EFT, surge, ring, dips), they can be upgraded to add further capability when required. Unique in their class, all three models include, as standard, an internal motor variac to enable dips and variation tests, at any user programmable level, as per IEC 61000-4-11.

The most significant test parameters can be programmed and then adjusted in real time to assist in finding the exact immunity level of an EUT. The +/- keys are used to adjust; test voltage level, EFT spike frequency, EFT burst duration, synchronisation angle, polarity and EUT supply voltage (via internal variac). The coupling paths; Line, Neutral and Protective Earth can either be automatically programmed or manually selected using switches on the front panel.

Standard accessories include 10A and 16A mains cables, GENECS remote control software on a CD, serial link cable to use with the GENECS software, user manual with verification protocol and conformity declaration.

- TRA2000

Capable of being equipped with ESD up to 15kV air discharge (requires ESD2000), EFT, CWG up to 4kV (1.2/50µs open circuit and 8/20µs short circuit), AC dips/interrupts & variations plus DC interrupts. TRA2000 features a single phase 16AAC/DC CDN enabling all power borne immunity tests to be performed on a single EUT without unplugging or reconfiguring the test set-up.

TRA2000 limited feature versions can be upgraded to full configuration when the need for additional tests arises.

- TRA2000IN4

Similar to TRA2000 as described above, TRA2000IN4 has enhanced capability in the form of a 10/700µs surge impulse for telecom testing up to 4kV and the 100kHz ring wave for ANSI C62.41 and IEC61000-4-12, up to 6kV. Just like TRA2000, an automatic integrated single phase CDN enables EUT power to be supplied continuously even when switching between test types.

- TRA2000IN6

A further enhancement of the TRA2000, TRA2000IN6 is the most complete compact generator available. Offering in a single unit phenomenal power and unparalleled capability. All the features available in both TRA2000 and TRA2000IN4 are included in the TRA2000IN6, plus the ability to perform CWG 1.2/50µs open circuit and 8/20µs short circuit and 10/700µs surges up to 6kV.

Long duration testing is made easier by use of the EMC PARTNER software packages. Using either GENECS or TEMA software, the units can be programmed, automatically started and test reports generated.

The compact design enables many different test standards to be performed using only a single unit. A broad range of accessories enable testing to many additional applications.

Special configurations are available to meet unique customer requirements, long duration voltage interrupts as required for Electricity meter testing (IEC62052-11 Annex B) are one example of the many unique capabilities available from EMC PARTNER.



TRA2000



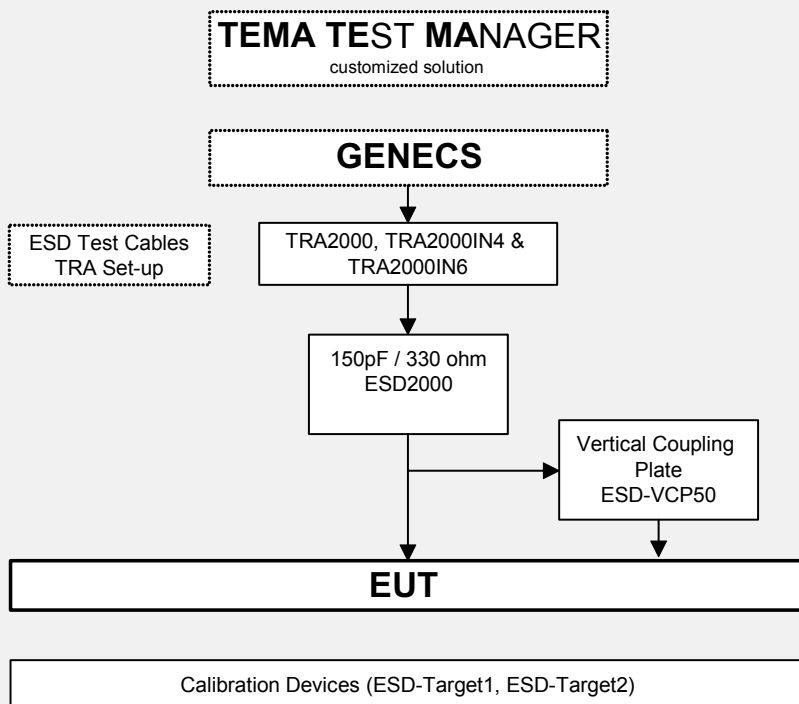
TRA2000IN4



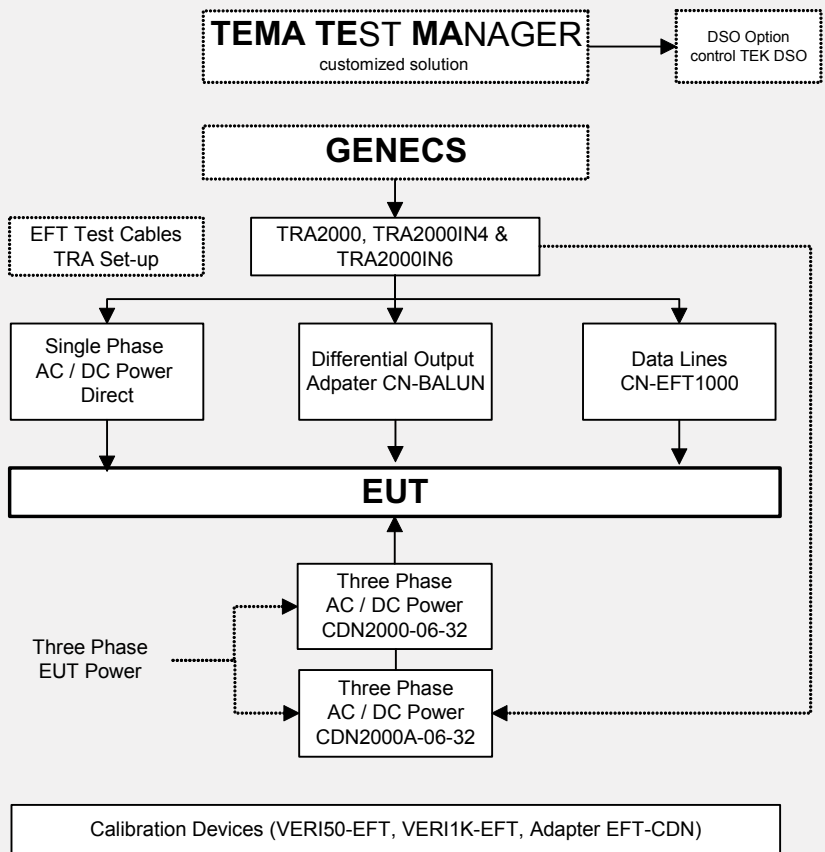
TRA2000IN6

Flowcharts

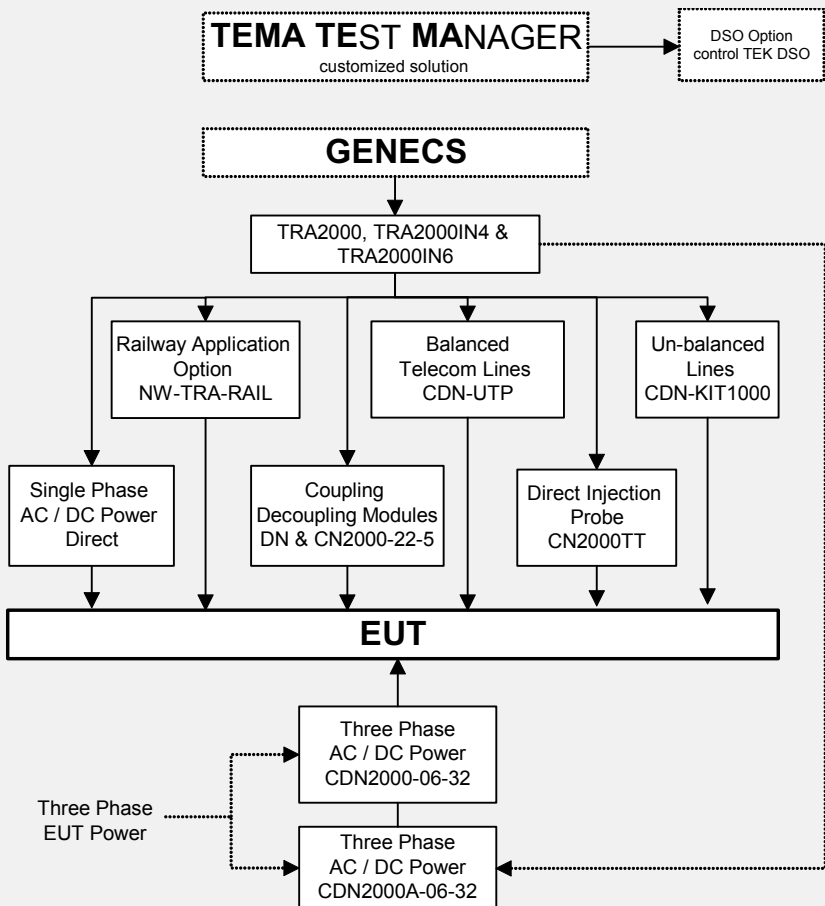
ESD



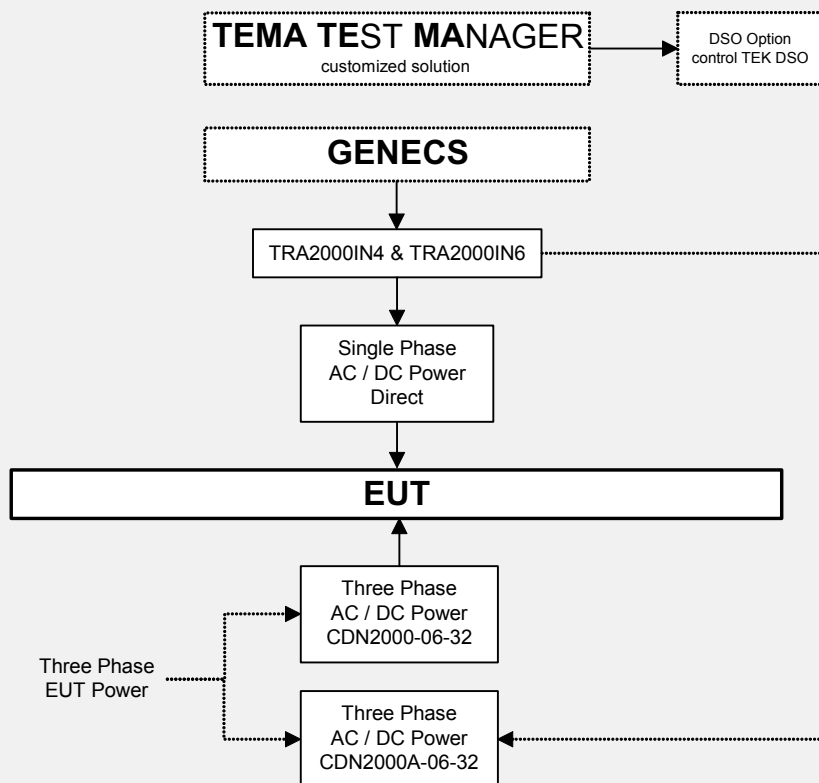
EFT



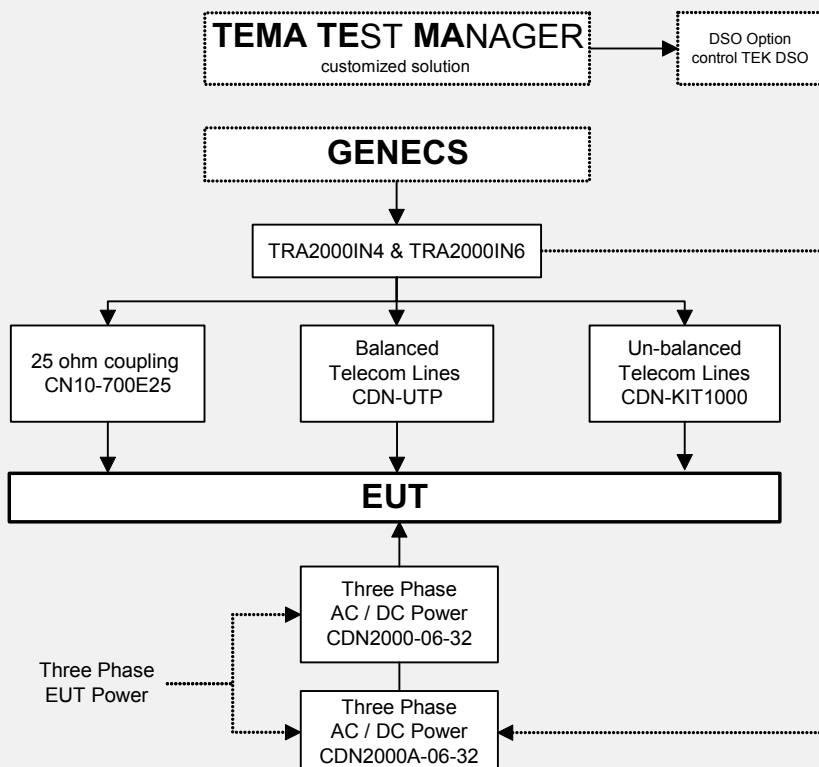
CWG



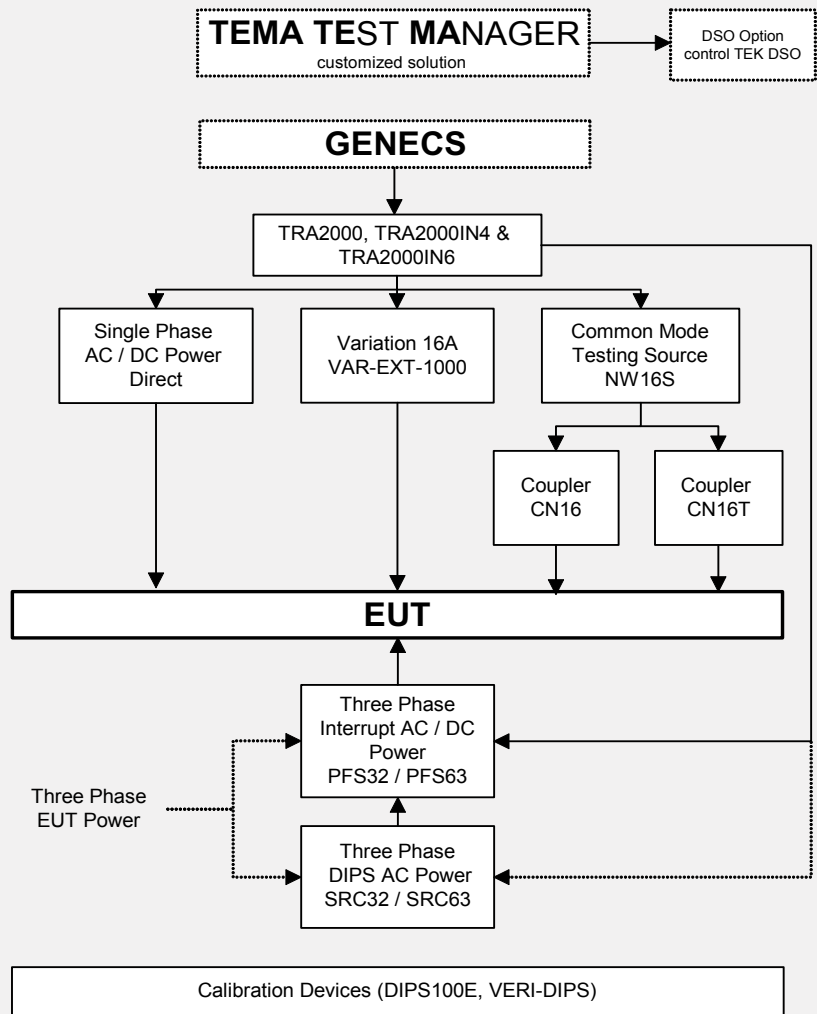
Ring Wave 100kHz



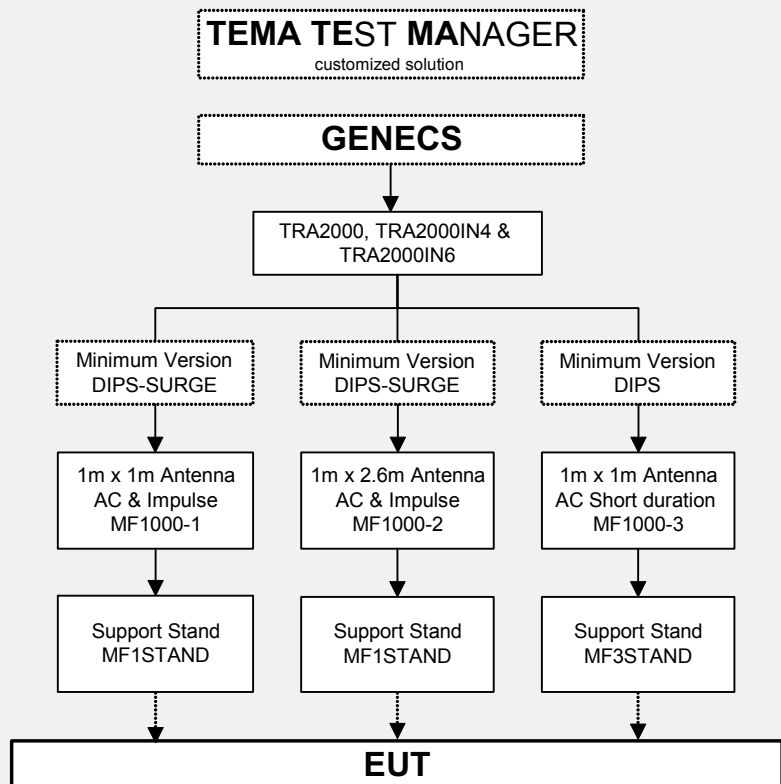
10/700μs



Dips/Variations and Common Mode Tests



Magnetic Fields



Generator Specifications

ESD

Air discharge	2 up to 16kV
Contact discharge	2 up to 10kV
Voltage increment resolution	1 volt steps
Contact discharge repetition interval	0.05 to 30s
Discharge detection	every pulse or real discharges only
Discharge counter	1 to 29999
Discharge polarity	positive, negative and alternating
Holding time	5s
Programmable parameter ramps	voltage, polarity
Discharge trigger	manual or automatic

EFT

Voltage range	0.25 up to 4.4kV
Source impedance	50ohm
Pulse front time at 50ohm	5ns
Pulse duration at 50ohm	50ns
Spike repetition frequency	up to 1MHz
Programmable parameter ramps	voltage, spike frequency, burst duration, synchronisation
Spike distribution	IEC burst pattern and random

CWG

Voltage range	0.25 up to 4.1kV (6kV for TRA2000IN6)
Current range	0.125 up to 2.1kA (3kA for TRA2000IN6)
Source impedance	2ohm
Pulse front time at open circuit	1.2µs
Pulse duration at open circuit	50µs
Pulse front time at short circuit	8µs
Pulse duration at short circuit	20µs
Pulse repetition	up to 20 pulses per minute
Programmable parameter ramps	voltage, synchronisation
Synchronisation on power line frequencies	16Hz up to 400Hz

10/700µs

Voltage range	0.25 up to 4kV (6kV for TRA2000IN6)
Current range	16.6 up to 266A for TRA2000IN4 / 400A for TRA2000IN6
Source impedance	15ohm + 25ohm
Pulse front time at open circuit	10µs
Pulse duration at open circuit	700µs
Pulse front time at short circuit	4µs (40ohm)
Pulse duration at short circuit	300µs (40ohm)
Pulse repetition	up to 4 pulses per minute

100kHz Ring Wave

Voltage range	0.25 up to 6kV
Current range	20 up to 500A
Source impedance	12ohm & 30ohm
Pulse front time at open circuit	0.5µs
Pulse oscillation frequency	100kHz

Pulse decay	60% first to second peak
Pulse repetition	up to 10 pulses per minute

Dips/Interrupts

Voltage range	0 up to 260Vrms
Frequency range	DC up to 400Hz with external supply
Rated current	16A for dips 0/100%
Interruption period	50µs up to 30s
Selectable dip range	0 up to 100% continuously 1)
Phase synchronisation	dips, interrupts & EUT supply

¹⁾ 5A dips with standard variac. 16A dips requires VAR-EXT1000.

Selection Guide

Generator	Circuit(s)	Upgrade	Option
TRA2000	ESD, EFT, surge, dips	No	-
TRA2000	dips	Yes	-
TRA2000	ESD, EFT	Yes	-
TRA2000	surge, dips	Yes	-
TRA2000	ESD, EFT, dips	Yes	-
TRA2000	ESD, EFT, surge	Yes	-
TRA2000	EFT, surge, dips	No	-
TRA2000	surge	Yes	-
TRA2000IN4	ESD, EFT, surge, 10/700, ring wave, dips	No	-
TRA2000IN4	EFT, surge, 10/700, ring wave, dips	No	-
TRA2000IN6	ESD, EFT, surge, ring wave, dips	No	10/700µs
TRA2000IN6	EFT, surge, ring wave, dips	No	10/700µs
TRA2000IN6	surge, ring wave, dips	No	10/700µs
TRA2000IN6	EFT, surge	No	10/700µs
TRA2000IN6	ESD, surge	No	10/700µs
TRA2000IN6	ESD, EFT, surge, ring wave	No	10/700µs

Accessories and Options

Vertical Coupling
Plate ESD-VCP50



CDN2000-06-32



TEST SETUP

Test package for ESD and EFT testing. This includes all the mechanical items needed to perform these test types. Vertical coupling plate with 2 x 470kohm resistors and 2 x 10cm EFT insulation.

CDN2000-06-32 for Three Phase Coupling

Add three phase capability with automatic or manual three phase coupling networks. The CDN2000A-06-32 and CDN2000-06-32, can be used for EFT, CWG surge and ring wave. Coupling path selection is either automatic under software control, or manual on the CDN front panel. All coupling networks fulfill the requirements laid down in the IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-12 (ring wave) and ANSI C62.41 standards.

Single Phase Solutions		Three Phase Solutions	
Generator	Internal CDN	Coupler	External CDN
TRA2000	280V L/N- PE L to N 280V	CDN2000A-06-32 or CDN2000-06-25 or CDN2000-06-32	280V Lx/N to PE 415V Lx - LX/N
TRA2000	280V L/N- PE L to N 280V	CDN2000A-06-32 Option 480V	280V Lx/N to PE 480V Lx - LX/N
TRA2000IN4	280V L/N- PE L to N 280V	CDN2000A-06-32 or CDN2000-06-25 or CDN2000-06-32	280V Lx/N to PE 415V Lx - LX/N
TRA2000IN4	280V L/N- PE L to N 280V	CDN2000A-06-32 Option 480V	280V Lx/N to PE 480V Lx - LX/N
TRA2000IN6	280V L/N- PE L to N 280V	CDN2000A-06-32 or CDN2000-06-25 or CDN2000-06-32	280V Lx/N to PE 415V Lx - LX/N
TRA2000IN6	280 V L/N- PE L to N 280 V	CDN2000A-06-32 Option 480V	280V Lx/N to PE 480V Lx - LX/N
TRA2000IN6	280V L/N- PE L to N 280V	CDN2000A-06-32 ¹⁾ or CDN2000-06-25 or CDN2000-06-32	280 V Lx/N to PE 415V Lx - LX/N

1) OPTION 480V / CMC extends the TRA2000IN6 for L1+L2+L3+N to PE (ANSI C62.45).

CN2000TT MC

Test pistol for direct current injection of surge and 10/700µs according to IEC 61000-4-5. Cable length 1.5m with MC plugs. The test pistols can be used together with MIG system equipped with MC plug outputs on front panel or networks (NW).



CN2000TT MC

CN16-450C

Single phase CDN for superimposing surge and EFT into power lines. EUT power supply up to 16A at 115V 400Hz.



CN16-450C

ESD2000

ESD discharge network to fulfill IEC 61000-4-2 requirements. For full details, please refer to brochure "ESD Testers".



ESD2000

CN-EFT1000

Capacitive coupling clamp 100ohm according to IEC 61000-4-4 including 1m coax cable with BNC connectors.



CN-EFT1000

VERI50EFT

50ohm termination with high voltage BNC connector and integrated divider for EFT calibration / verification in accordance with IEC 61000-4-4 Ed2.



VERI50EFT

VERI1KEFT

1kOhm termination with high voltage BNC connector and integrated divider for EFT calibration / verification in accordance with IEC 61000-4-4 Ed2.



VERI1KEFT

CN-BALUN

Balanced/unbalanced transmission line transformer for EFT and 1MHz damped sine according to ANSI/IEEE C.37.90. Including coaxial cable with HV-BNC plugs (3x 0.5m), test tip + HV-BNC adapter (1 red, 1 black) and HV-BNC connector (2x).



CN-BALUN

Example of interrupt capability



TRA OPTION TEST 3.2

TRA2000 extension for special burst and dips/interrupts according to IEC 62052-11 and Indian standard 13779.

Three bursts of 1s duration within a 10 minute period.

Three interruptions lasting one second each with 50ms spacing, in accordance with IEC 62052-11 annex B.

ADAPTER EFT-CDN

Adapter cable which enables EFT impulses to be measured at the output of either a single or three phase CDN as required by IEC 61000-4-4 Ed.2.

CDN-UTP



CDN-UTP

The CDN-UTP is a sophisticated coupling and de-coupling network for superimposing surge impulses on balanced communication lines in accordance with IEC 61000-4-5 (Figure 12: unshielded symmetrical interconnection lines), ITU-K20, K21 and FCC part 68.

It is designed for 1.2/50µs and 10/700µs pulses up to 6.6kV.

CDN-UTP is also available with 4 pairs (8 lines) as the CDN-UTP8 version.

CDN-KIT1000



CDN-KIT1000

Surge coupling-decoupling network for data lines according to IEC 61000-4-5. Comprises one universal coupling module, one low frequency and one high frequency decoupling module.

OPTION
NW-TRA-RAIL



NW-TRA-RAIL

Applicable standards are IEC 60571 Ed. 2.0b, EN 50155 and RIA12.

TRA2000 and option NW-TRA-RAIL fulfill the waveform A impulse requirement.

Waveform A: 5/50µs (1.8kV), Zout 100ohm.

In combination with the ESD3000DM8 which generates the higher level waveform B impulse.

DN2000-22-5



DN2000-22-5

Decoupling module for IEC 60255-22-5 applications. 20mH inductance, 275V varistor to protect auxilliary equipment.

CN2000-22-5



CN2000-22-5

Coupling module for IEC 60255-22-5 applications. 40ohm resistor and 0.5µF capacitor for coupling surge.

VAR-EXT1000



VAR-EXT1000

External 16A variac module extends the internal capability for higher powered EUTs.

VERI-DIPS



VERI-DIPS

Measuring set for calibration/verification of the EUT inrush current.

NW16S

AC and DC voltage tests can be performed by adding the NW16S voltage source. Tests can then be performed for

- continuous mode (with 2 ranges up to 1V and up to 30V)
- short duration mode (1s up to 10V and up to 300V)

Two coupling networks are available: CN16 for powerlines and CN16T for telecom lines.



NW16S

CN16 and CN16T

Coupling networks for power lines and telecom lines. Use with NW16S.



CN16

PFS

PFS extends the Transient Test System to include three phase testing of AC and DC interrupts up to 480V and 32A in accordance with IEC 61000-4-34.

Available with different current ratings:

- PFS32 for interruptions up to 32A per phase
- PFS63 for interruptions up to 63A per phase



TRA2000 with PFS32 and SRC32

SRC

SRC extends the Transient Test System to include three phase testing of AC dips up to 480V and 32A in accordance with IEC 61000-4-34. Requires one RFS unit.

Available with different current ratings:

- SRC32 for dips up to 32A per phase
- SRC63 for dips up to 63A per phase

TRA OPTION 75A to SRC63

Extends the SRC63 and RFS63 combination up to 75A per phase in accordance with IEC 61000-4-34.

MF1000-1, MF1000-2 and MF1000-3

Applicable standards are IEC 61000-4-8 for a.c. and IEC 61000-4-9 for impulse magnetic fields.

Antenna	Coil dimensions	AC magnetic fields (50/60Hz)	Impulse magnetic fields (8/20µs)
MF1000-1	1m x 1m	1 up to 130A/m	0.1 up to 1.5kA/m
MF1000-2	1m x 2.6m	1 up to 110A/m	0.1 up to 1.1kA/m
MF1000-3	1m x 1m	0.3 up to 1kA/m	



MF1000-1
MF1000-2
MF1000-3

NW-K44PC

Power contact network for telecom testing in accordance with ITU-T K44, K20, K21. For use with DIPS circuit of TRA2000x.

TRA OPTION NW-K44PI

Power induction network for telecom testing in accordance with ITU-T K44, K20, K21.

Requires NW-K44PC.



NW-K44 PC with TRA
OPTION NW-K44PI

PCPI160E

Power contact current limiting resistor network for telecom testing in accordance with ITU-T K44, K20, K21.

For use with NW-K44PC.

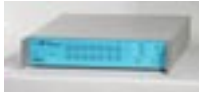


PCPI160E
(one of two equal
units)

DIPS100E



PS3



PS3



DIPS100E

100ohm non-inductive resistor for calibration of dips/interrupts switching times.

PS3

Easy to use power supply for common voltage/frequencies. Output selected between 230V/50Hz, 115V/60Hz, 230V/16.7Hz and 115V/400Hz. 3000W capability.

PS3SOFT-EXT

PS3SOFT-EXT extends PS3 for applications such as IEC 61000-4-28 and magnetic field at 16.7Hz.

Software

Remote control from a PC requires the OPTICAL LINK and one of the following software packages:

- GENECS is a relatively simple program that reproduces generator front panel functions on a PC. In addition to remote programming and control of the generators, test report information is available to word processing or other evaluation programs such as EXCEL. GENECS is supplied with each instrument or downloaded free of charge from the EMC PARTNER website. Firmware can be updated using the serial link provided.
- TEMA Software: Comfortable control of EMC PARTNER generators from a PC. Includes also control for ESD3000 and MIG2000 systems. Generates an enhanced level of test report.

Predefined test routines

Surge Testing requirements per IEC 61000-4-5

Version: 21.03.00, based on 61000-4-5 IEC 2001
EMC Partner Generator - Overview

Content

2. Exposure Classes

3. Test Levels, Combination wave

3.1. CWS - Power supply
3.2. CWS - Unbalanced operated datalines, LNB (LNB - long distance line)
3.3. CWS - Balanced operated datalines
3.4. CWS - LNB and BNB (LNB - short distance line)

4. Test Levels, 10/100us (for ports of long distance)

4.1. 10/100us - Balanced operated datalines

1. General

The Basic EMC Standards for Surge define the methods of detail to produce reproducible results between test sites.

While the Basic EMC Standard specifies how to perform Sur IEC 61000-4-5 also includes climatic specifications as follows:

Ambient temperature: 10°C to 35°C
Relative Humidity: 10% to 75%
Atmospheric Pressure: 86kPa (630 mbars) to 106kPa

Other values may be specified in the test specification.

The surge test can be described to the EUT if appropriate.

2. Exposure Classes

The test level is set by the Surge test form (S3) as a level

Class	Description
0	Unprotected
1	Partly protected (Electrical equipment)
2	Electrical equipment where cables are well supported, even at short runs

IEC 1000-4-5: Surge on balanced datalines - Line to Earth - Class 5

10.08.17 09:06 EMC PARTNER AG, CH-1400, Switzerland
Operator: R. Gaudenzi LNB
Run-time: 40.000s x 1000 x 1000

Test Manager - IEC 1000-4-5 class 5 test

1. CWS on balanced datalines - Line to Earth - 1000V
Load Setup: Data-1000V
Spikes per and neg. every 20 seconds (Total 100000)
Result: Test not run

2. CWS on balanced datalines - Line to Earth - 1000V
Load Setup: Data-1000V
Spikes per and neg. every 20 seconds (Total 100000)
Result: Test not run

3. CWS on balanced datalines - Line to Earth - 1000V
Load Setup: Data-1000V
Spikes per and neg. every 20 seconds (Total 100000)
Result: Test not run

4. CWS on balanced datalines - Line to Earth - 1000V
Load Setup: Data-1000V
Spikes per and neg. every 20 seconds (Total 100000)
Result: Test not run

EMC PARTNER's Product Range

The Largest Range of Impulse Test Equipment up to 100kA and 100kV.

Immunity Tests

Transient Test System performs all of the following tests on electronic equipment as required for the CE-mark up to full levels: ESD, EFT, surge, dips, a.c. magnetic field, surge magnetic field and common mode tests. A large range of accessories for different applications is available: MF antennas, three phase couplers, verification sets, coupling kits, etc. The Transient Test System complies with IEC 61000-4-2, -4, -5, -8, -9, -11, -12p, -16p, -29p.

TRA2000, ESD3000 and CDN2000A-06-32 – a complete automatic three-phase test system



Lightning Tests

EMC PARTNER offers a wide range of testers in accordance with national and international standards. These include FCC 68 part D, ITU K.44, ETS 300 046, Bellcore GR1089 for telecom, RTCA DO160D for aircraft and MIL-STD-461E for military electronic equipment testing.

MIG0600MS and MIG-OS-MB – a multiple stroke and multiple burst aircraft test system



Component Tests

EMC PARTNER offers a wide range of modular impulse generators (MIG) for transient component testing on: varistors, arresters, surge protective devices (SPD), capacitors, circuit breakers, watt-hour meters, protection relays, insulation material, suppressor diodes, connectors, chokes, fuses, resistors, emc-gaskets, cables, etc.

MIG1212CAP – an automatic 8 bank capacitor test system



Emission Measurements

One unit performs all measurements on the power supplies of electronic equipment and products for the CE-Mark.

The HAR1000 includes an amplifier for a clean power source, a line impedance network, the measurement systems Harmonics and Flicker. Accessories: three phase extension and HARCS Immunity software. Complies with IEC/EN 61000-3-2 and -3.

HAR1000-3P and HARCS Software – a complete three-phase harmonics and flicker test system

